Douglas-fir Tussock Moth Handbook

United States
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Combined Forest Pest
Research and
Development Program

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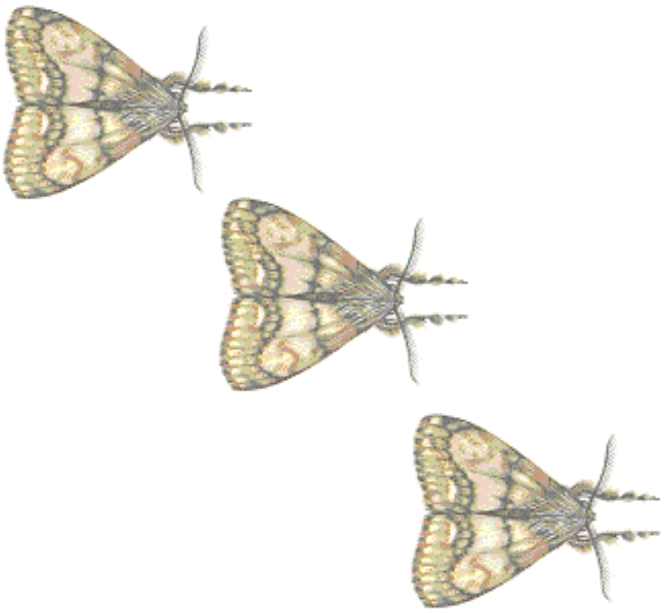

How to Identify Tussock Moths Caught in Pheromone Traps

In 1974 the U.S. Department of Agriculture initiated the Combined Forest Pest Research and Development Program, an interagency effort that concentrated on the Douglas-fir tussock moth in the West, on the southern pine beetle in the South, and on the gypsy moth in the Northeast. The work reported in this publication was funded in whole or in part by the Program. This manual is one in a series on the Douglas-fir tussock moth.

How to Identify Tussock Moths Caught in Pheromone Traps

by G. E. Daterman[1], R. L. Livingston[2], and R.G. Robbins[3]

Sticky traps baited with synthetic sex pheromone ((Z)-6-heneicosen-11one) can be used to help predict outbreaks of the Douglas-fir tussock moth *(Orgyia pseudotsugata).* Numbers of adults captured in the fall can be compared with numbers of larvae taken the following spring. This information will help in predicting areas of potential defoliation. The pheromone traps may also be used to detect tussock moths in places where there are too few to be found by other means.

Because other closely related species of moths are also attracted by the Douglas-fir tussock moth pheromone, those who use these traps must be careful when interpreting the data. Exaggerated counts caused by including other insect species could influence the results. This pictorial guide identifies the various species of moths most likely to be captured by tussock moth traps in the Western United States and British Columbia.

The species listed here include those that inhabit forested regions of the West whose seasonal mating flights coincide with flights of the Douglas-fir tussock moth. Except as noted below, all trapping to develop this technique was done from August through mid-November. It is highly probable that additional species would be captured by the pheromone bait if traps were placed in different habitat types or in different geographic regions, or were exposed at different times of the year. This report covers only those species that are most likely to be encountered when trapping for the Douglas-fir tussock moth.

Figure 1 shows a pheromone trap in place on a host tree, and figure 2 illustrates the condition of captured moths on the interior surface of such a trap. Occasionally trapped specimens become so entangled in the trap adhesive, so dirty, or so damaged by scavengers (chiefly ants or yellow jackets) that identifying characteristics cannot be distinguished. These conditions can be minimized by not leaving traps in the field any longer than necessary, and by cleaning dirty or adhesive-soaked specimens. Specimens can often be restored to nearly original condition by soaking them in xylene or kerosene and then rinsing them in hexane. The specimens can then be dried, relaxed by exposure to high humidity, and pinned for storage.

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[2] *State of Idaho Department of Public Lands.*
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Figure 1. – Tussock moth pheromone trap.

Figure 2.—Opened trap showing captured moths.

When all other attempts at identification fail, specimens can be sent to entomologists at the Forestry Sciences Laboratory, Forest Service, Forest Insect Research, 3200 Jefferson Way, Corvallis, Oreg. 97331. Care should be taken to protect specimens from damage during shipping.

Tussock Moths (*Orgyia* Species)

Douglas-fir Tussock Moth, *O. pseudotsugata* (McDunnough)

The Douglas-fir tussock moth is found in substantial numbers throughout most of its primary hosts' ranges (Douglas-fir, grand fir, white fir), although it is less abundant in Montana east of the Continental Divide, and in Oregon and Washington on the west side of the Cascades (fig. 3).

In the northern part of its range, *O. pseudotsugata is* generally darker (fig. 4) in comparison to its general appearance in its southern range (fig. 5). The darker form predominates in British Columbia, Oregon, Washington, northern California, northern Idaho, and Montana. The lighter, southern form (characterized by greater color contrasts in wing markings, and brown and buff wing colors) is usually found in central and southern California, southern Idaho, Utah, Nevada, Colorado, New Mexico, and Arizona. These color-form distributions are only generalizations since some darker specimens turn up in southwestern locations, as do lighter forms in the north (fig. 6).

Forewings of *O. pseudotsugata* are gray brown to black brown (brown tones may predominate in some specimens), with dark transverse markings that are sometimes indistinct. Look for a distinct white spot near the posterior margin of the forewing and a white or buff (sometimes rusty brown) blotch or chevron marking on the anterior-central area of the forewing. The underside of the forewings and both surfaces of the hindwings are brown, sometimes with gradations of black brown on wing borders. The average wingspan of this species is 31 mm (range= 25-34 mm).

Figure 3 (left). – Douglas-fir tussock moth distribution as determined by collecting and pheromone traps.

Figure 3 legend:

- Host type
- Major outbreak areas
- Known collection points as of 1973
- Pheromone-trap collection areas from 1975 trapping

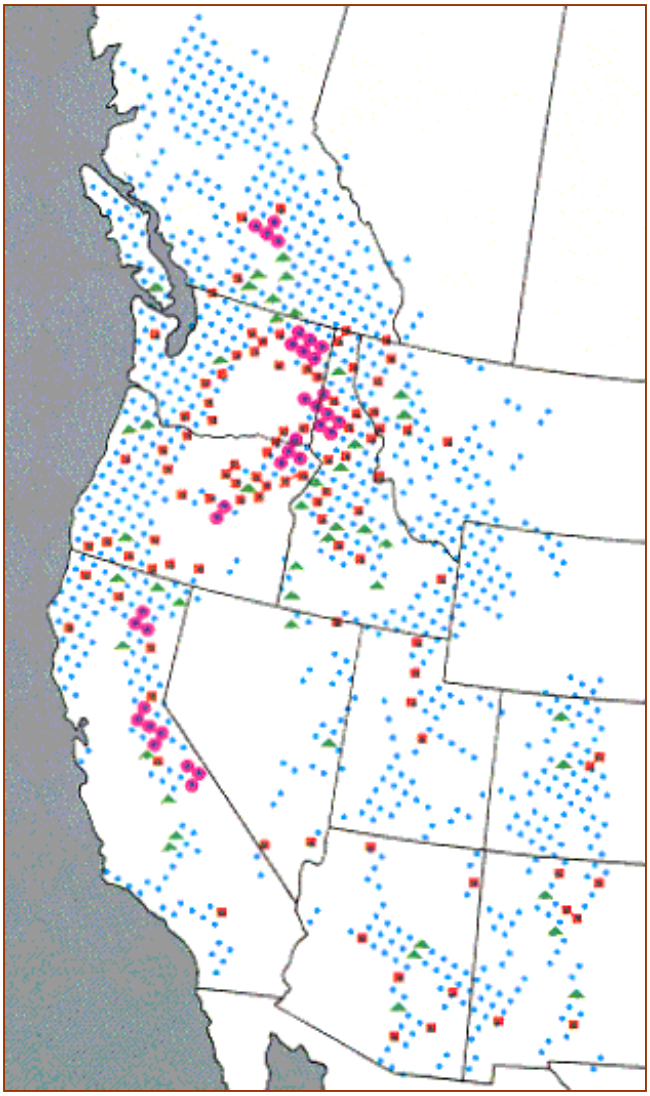


Figure 4 (above). – Dark color form of Douglas-fir tussock moth, O. pseudotsugata.

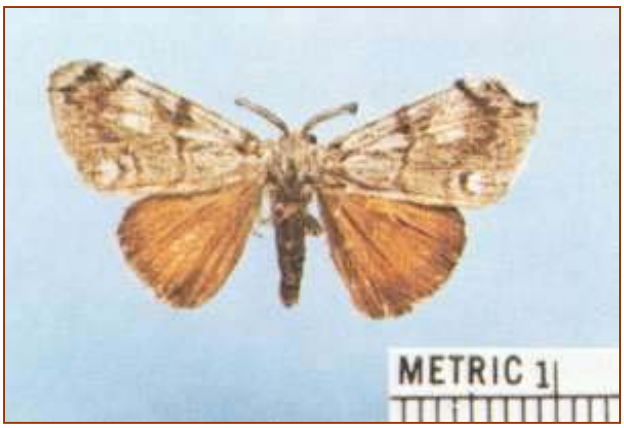


Figure 5. – Light color form {of Douglas-fir tussock moth, O. pseudotsugata.}

Figure 6. – Dark and light color forms {of Douglas-fir tussock moth} from southern Idaho.

Depending on locality, male Douglas-fir tussock moths may be in flight from August into November. Peak activity is generally in August or early September in the Southwest but can extend well into October in some northern areas. At a given locality seasonal flight usually continues for 8-10 weeks, but this can vary from year to year. At a southern Oregon location in 1974, for instance, flight ceased by October 1; but at the same location in 1976, peak activity occurred in mid-October, and a few insects were still flying the second week of November.

Western Tussock Moth, *O. cana (*Edwards)

The scientific name of the western tussock moth was recently changed from *Orgyia vetusta* (Boisduval) to *Orgyia cana* (Edwards) (personal communication with Dr. Douglas Ferguson, U.S. National Museum, Washington, D.C.). This species is smaller but generally very similar in appearance to the Douglas-fir tussock moth. Forewings are gray black with brown shading; transverse markings are present but often indistinct. Hindwings have a shade more brown, especially on the ventral side. The white spot on the posterior margin of the forewing is often less distinct than that on the Douglas-fir tussock moth. The white blotch or chevron marking on the anterior-central area of the forewing is also less distinct and sometimes missing altogether (fig. 7).

Figure 7. – Western tussock moth, O. cana.

If specimens of western tussock moth cannot be distinguished from the Douglas-fir tussock moth on the basis of appearance, a size comparison can be made. Average wingspan of the western tussock moth is 26 mm (range = 22-31 mm) as compared to an average of 31 mm for the Douglas-fir tussock moth. If size is the basis for distinction, however, many specimens should be measured because there is an overlap between the species.

Another way to distinguish between western and Douglas-fir tussock moths is to compare the genitalia. Simply detach the abdomen and place it in a dissecting dish containing alcohol. If necessary, remove any adhesive from the trap by soaking the specimen in xylene, kerosene, or hexane. Examine the tip of the abdomen under low magnification with a dissecting microscope and carefully remove one of the valvae, or claspers (paired sclerotized structures on the tip of the male abdomen that grasp the female genitalia during mating). Next, remove the small scales from the tip of the valvula (sometimes called ventral lobe) with fine-pointed forceps (fig. 8).

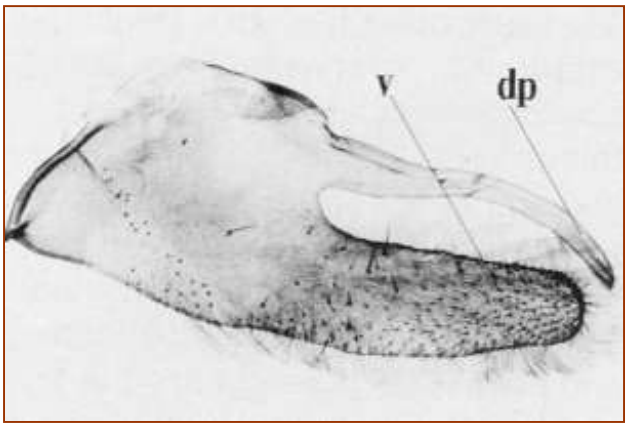


Figure 8. – Valve or clasper of western tussock moth. dp = dorsal process; v = valvula; 40x.

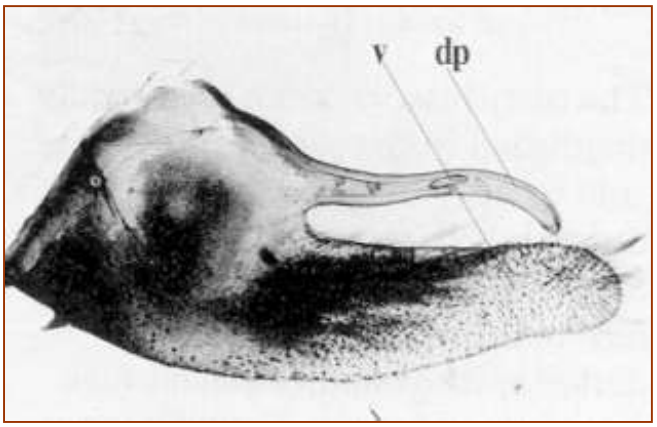


Figure 9. – Valve of clasper of Douglas-fir tussock moth. dp = dorsal process; v = valvula; 40 x.

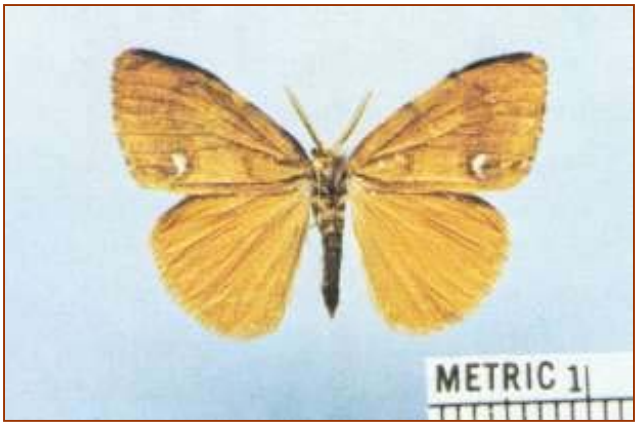
Then compare the relative length of the dorsal process (sometimes called dorsal lobe) to the length of the valvula (figs. 8 and 9). The dorsal process is often strongly curved, and this curvature must be considered when determining the relative lengths of the claspers. In the western tussock moth the dorsal process extends past the tip of the valvula (with some specimens it is necessary to flatten the curve of the process in order to measure accurately). In the Douglas-fir tussock moth the dorsal process is shorter than or nearly as long as the valvula (fig. 9).

The range of the western tussock moth varies from that of the Douglas-fir tussock moth, although some overlap undoubtedly occurs. Specimens have been recovered in traps in Idaho. Utah, Nevada, Montana, and northeastern California. Although the larvae prefer to feed on shrub foliage, they will also feed on conifers. Seasonal flights of the western tussock moth probably occur earlier than the Douglas-fir tussock moth, but some overlap in flight period can he expected.

Rusty Tussock Moth, *O. antiqua* (L.)

The rusty tussock moth is frequently captured in pheromone traps. It is abundant both on the west side of the Cascades and in the comparatively dry interior of Idaho, Montana, southern British Columbia, and eastern Oregon and Washington. South of this, the species is less common and has not been caught at all in traps in the Southwestern United States.

The rusty tussock moth is easily distinguished from other species by its gold to rusty-brown color (figs. 10 through 12). In northern Idaho and in Montana the predominant color pattern of this species is somewhat darker, with gradations that range to very dark brown. The white spot on the posterior margin of the forewing is very distinct in this species. Rusty tussock moths have been captured in pheromone traps from late June through October, which suggests multiple generations per year. This species feeds on a variety of hosts that include both broadleaves and conifers. It definitely overlaps the Douglas-fir



tussock moth in distribution and time of seasonal flight. Average wingspan is 27 mm (range = 23-30 mm).

Figure 10 (left). – Rusty tussock moth, O. antiqua.

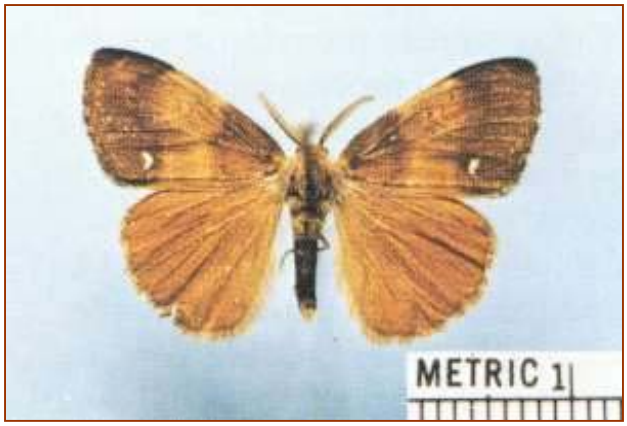


Figure 11. – Rusty tussock moth.

Figure 12.-- Rusty (right) and Douglas-fir (left) tussock moths in trap.

Whitemarked Tussock Moth, *O. leucostigma* (J.E. Smith)

The whitemarked tussock moth is primarily a defoliator of broad-leaved hosts in Eastern North America, although it has been found in Colorado and New Mexico. This species has been reportedly attracted by Douglas-fir tussock moth pheromone in eastern Canada, but has not yet been captured in pheromone traps in the West.

Figure 13. – Whitemarked tussock moth.

This tussock moth is more gray in color than the Douglas-fir, western, or rusty tussock moths and has little or no brown on the wings. The hindwings are gray on all surfaces with no brown tones at all. In contrast, the hindwings of Douglas-fir and western tussock moths have apparent brown shades on one or more surfaces. Average wingspan of the whitemarked tussock moth is 28 mm (range = 25-31 mm) (fig. 13).

Table 1 provides a summary of the key identifying characteristics of the four *Orgyia* species.

Table 1. – Identifying characteristics of four male moths of *Orgyia*.

Characteristics	*O. pseudotsugata*	*O. cana*	*O. antiqua*	*O. leucostigma*
White spot, posterior margin of dorsal forewing	Distinct	Less distinct	Very distinct	Distinct
Color of dorsal forewing	Gray brown to black brown, dark transverse markings (sometimes indistinct), white or buff blotch on anterior-central part of forewing	Similar to O. pseudotsugata	Gold to rusty brown, some very dark brown in Idaho and Montana	Gray with little or no brown
Color of ventral wing	Brown	Brown	Gold to brown	Gray
Average wingspan	31 mm (range: 25-34 mm)	26 mm (range: 22-31 mm)	27 mm (range: 23-30 mm)	28 mm (range: 25-31 mm)
Genitalia	Valvae, or claspers, with dorsal process slender and not reaching end of valvula	Valvae with dorsal process slender and extending past tip of valvula	Valvae smaller, more heavily sclerotized, dorsal process short of end of valvula	Valvae with dorsal process extending to tip of valvula, dorsal process less slender, structure less sclerotized
Flight period	August - November	July	Late June - October	Unknown

Tussock Moths (*Dasychira* Species)

Members of this genus have previously been in the literature under the generic names *Paroigyia* and *Olene.* At least some members of the genus are strongly attracted to the Douglas-fir tussock moth pheromone and are very abundant in parts of Oregon. Washington. Idaho, and Montana. A few specimens have also been captured in Colorado and New Mexico. The seasonal flight periods of *Dasvchira* species begin earlier than for those of the Douglas-fir tussock moth, so distribution records reported here for *Dasychira* are probably incomplete.

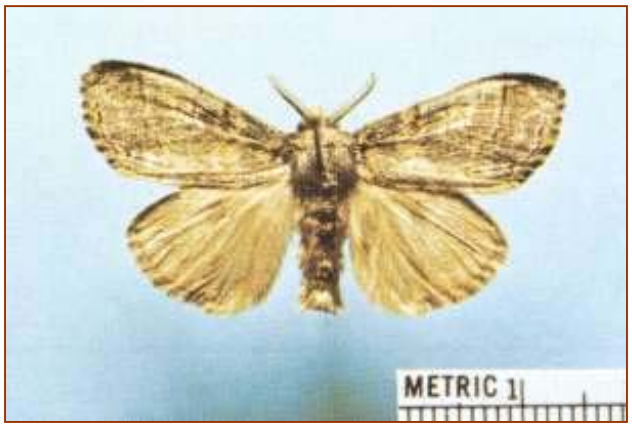


Figure 14. – Dasychira vagans grisea.

Dasvchira species are larger than Douglas-fir tussock moths (average wingspan is 37 mm) and have heavier body features (figs. 14 and 15). A characteristic feature is the presence of prominent tufts of scales on the dorsal anterior part of the abdomen. The tufts are bronze to black in color, 1 mm or so in height, and 1-2 mm in diameter. The Douglas-fir tussock moth and other *Orgyia* species may also have scale tufts in a similar position, but they are much smaller (less than 0.5 mm in any dimension).

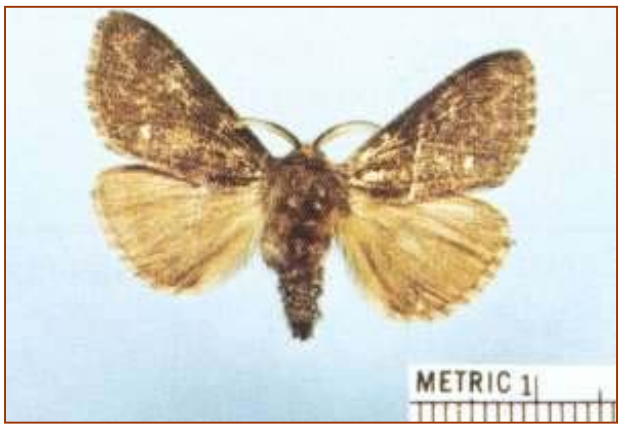


Figure 15. – Dasychira grisefacta ella.

On the west side of the Cascades in Oregon and Washington, the *Dasychira* captured in pheromone traps can generally be identified as to species. Moths fitting the above description with light-gray forewings and gray to gray-buff hindwings (fig. 14) are probably *Dasychira vagans grisea* (Barnes and McDunnough), which feeds primarily on broadleaved hosts. If the specimens have the same general appearance but the predominant color of the fore wings is charcoal gray to black (fig. 15), they are probably *Dasychira grisefacta ella* (Bryck), which feeds on conifers. In the areas west of the Cascades, both these species have earlier seasonal flights (June and July) than Douglas-fir tussock moths.

East of the Cascades, it is not possible to distinguish between species of trapped *Dasvchira* specimens. Both *D. vagans* and *D. grisefacta* are predominantly light gray and very similar in appearance. Fortunately, however, they are readily distinguishable from the Douglas-fir tussock moth.

Other Moths

Traps baited with the Douglas-fir tussock moth sex attractant occasionally capture moths not related to the tussock moth group. They probably blunder into the traps and are not considered significant in the trapping process.

Moths from the family *Geometridae* (loopers or inchworms) are commonly found. They are easily distinguished from tussock moths by their more delicate body structure, higher proportion of wing area to body size, lighter wing colors, and/or banded color patterns on the wings (figs. 2, 16, and 17).

Figure 16. – Typical geometrid or looper moth in trap, probably Lambdina *species. This type was captured throughout the trapping region.*

Figure 17. – Geometrid or looper moth captured in northern Idaho.

Acknowledgements

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To view a summary of current use the DFTM pheromone trapping system, including an evaluation based on 20+ years of observations, visit: www.fs.fed.us/r6/nr/fid/dftmweb/ews/